ASTM Standard Guide for Greener Cleanups

MA DEP Greener Cleanups Workshop

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BMP Process Case Study

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Case Study Objectives & Overview

Objective: Become familiar with using the five-step "BMP Process" described in Section 6.6 of the Guide, with an interactive focus on Step 2:

- ***Section 6.6.1 -- Step 1: BMP Opportunity Assessment***
- ***Section 6.6.2 -- Step 2: BMP Prioritization***
- ***Section 6.6.3 -- Step 3: BMP Selection***
- ***Section 6.6.4 -- Step 4: BMP Implementation***
- ***Section 6.6.5 – Step 5: BMP Documentation***

ASTM "BMP Process"

- Pertinent sections of Guide
- "Steps" specified in Guide

Case Study Activities:

Speaker (5'): Preview the case study scenario and site map

Speaker (5'): Summarize sample preliminary results of **Step 1, BMP Opportunity Assessment**

Group (20'): Collectively perform **Step 2, BMP Prioritization**

1) Use your worksheet to assign a "high," "medium" or "low" priority to each case study BMP.
2) Engage in group discussion of the variation or similarities of rationales used to prioritize each BMP

Speaker (5'): Provide overview of **Step 3, BMP Selection**, and **Step 4, BMP Implementation**

Speaker (10'): Provide overview of how the "BMP table" developed in Steps 1 through 4 is used in **Step 5, Documentation**; open **Q & A**

Case Study Scenario

General Site Description

Location: Three miles from Lake Michigan

Past Use: Closed landfill that accepted 30 million tons of solid municipal waste and 300 million gallons of hazardous liquid waste over 30 years

Anticipated Re-Use: Open space and environmental education center

Current Status of Remedial Actions

***Existing / Operating Remedial Components*:**

1) **Conventional clay cover** on approximately 1/3 of the site (50 acres)
2) **Landfill gas collection and treatment (flaring)** for entire site
3) **Leachate control and treatment system** for entire site:
   - *Control:* -**Additional wells needed to optimize extraction** along landfill perimeter
   - -**Treated water discharges** into onsite tributary
   - *Treatment*: Pre-treatment (filtration, oil/grease separation, etc.) followed by **air stripping and GAC adsorption**

***Remedial Components to be Designed and Constructed*:**

1) **Cover** for remaining 150 acres
2) **Institutional controls**

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Applicable "**cleanup phase**":

- Remedy operation, maintenance and monitoring
- Remedy optimization

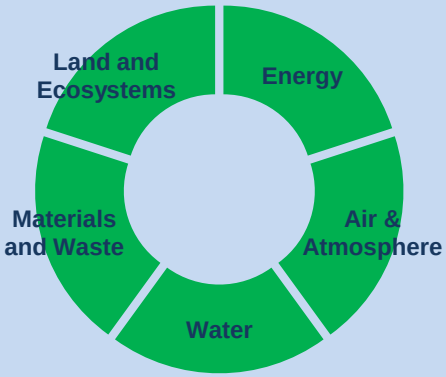
- Remedy design and implementation

Case Study Scenario (continued)

Project Priorities Relating to Core Elements of Greener Cleanups

- **High volume of fuel needed** for excavation, grading, and construction of landfill cover and onsite roads
- **Stringent air emission requirements for mobile sources**, due to site location in air quality non-attainment area
- **Current discharge of treated leachate/water**, due to recent EPA/USACE Clean Water Act clarification of "tributary"
- **Limited availability of onsite/nearby raw materials** e.g. clean fill and topsoil for cover construction and infrastructure, due to urban setting
- Outlying **buffer zone for breeding grounds** of endangered waterfowl species

Potential drivers of BMP prioritization at case study site



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5. Planning and Scoping

5.1.4 The *user* should compile ***site* data, such as environmental, demographic, and land use characteristics and other factors that influence the *cleanup***.

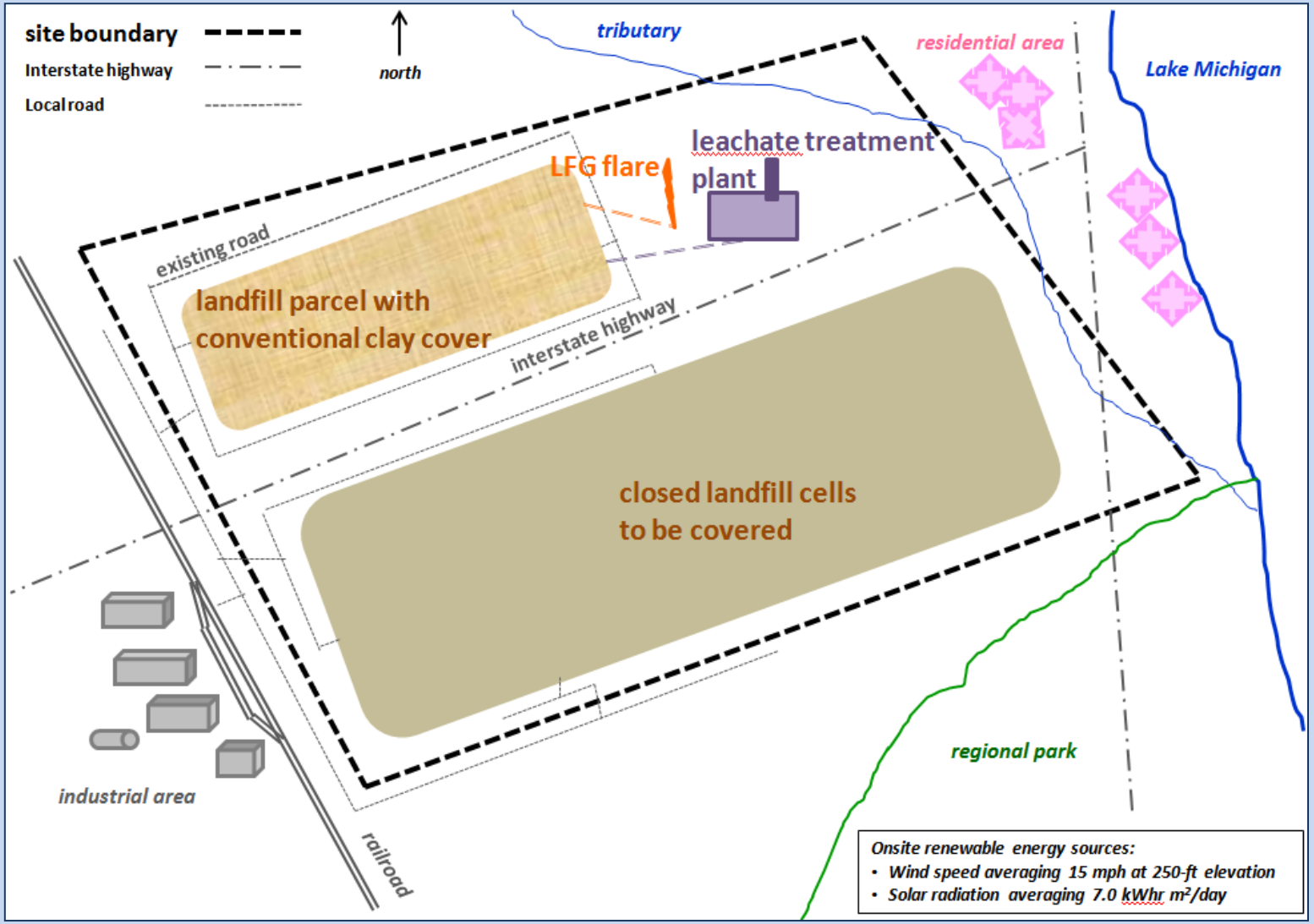
5.1.4.1 The *user* should identify the *site* size; potential or actual environmental media impacts; the types of *contaminants* present and their distribution, if known; and other *site* characteristics relevant to the use of this *guide*.

5.1.4.2 The *user* should identify the current and *reasonably anticipated future use* (if known) for the *site* and for properties located proximal to the *site*.

5.1.5 The *user* should identify key *stakeholders* and assess their interests and concerns regarding the *cleanup* activities being considered and/or the potential reuse options for the *site*.

5.1.6 The *user* should consider the budget and schedule, as well as any cost constraints or other limitations for the project, and determine how the *BMP process* or *quantitative evaluation* will be integrated into the project in light of those factors.

Case Study Map



Case Study: ASTM Step 1, BMP Opportunity Assessment

This table reflects results of a "BMP opportunity assessment" previously conducted by:

- Screening the Guide's Appendix X3, "Greener Cleanup BMP Table," to identify all potential BMPs applying to the case study site
- Adding additional BMPs identified in other materials

Screening BMP Applicability

- **Possible screening criteria to identify BMPs applying to the project's:**
  - ❑ **Remediation technologies**
  - ❑ **Technology design parameters**
  - ❑ **Field processes and techniques**
  - ❑ **Existing or anticipated site infrastructure**
  - ❑ **Requirements set by local ordinance, client, etc.**
  - ❑ **Constraints or needs**
  - ❑ **. . . and add your own findings**

Remedial Components	Number of Applicable BMPs Applicable to Case Study Site (Sorted by BMP Category)							
	Materials	Power & Fuel	Project Planning & Team Management	Sampling & Analysis	Site Preparation/ Land Restoration	Surface/ Storm Water	Vehicles & Equipment	Wastewater
Existing / Operating Components								
Conventional clay cover	3	3	3	2	2	2	2	2
Landfill gas collection and treatment (flaring)	2	2	0	1	1	0	2	0
Leachate control and treatment system	3	3	0	2	1	2	2	3
Subtotal	*8*	*8*	*3*	*5*	*4*	*4*	*6*	*5*
Remedial Components to be Designed and Constructed								
Cover system	*6*	*4*	*5*	*2*	*7*	*3*	*4*	*2*
Institutional controls	*2*	*2*	*3*	*0*	*0*	*0*	*3*	*0*
Subtotal	*8*	*6*	*8*	*2*	*7*	*3*	*7*	*2*
Total	*16*	*14*	*11*	*7*	*11*	*7*	*13*	*7*

86 BMPs applicable to this case study site

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6.6.1 Step 1: BMP Opportunity Assessment—This is a **screening level assessment**. During this step, the *user* identifies all *BMPs* considered potentially applicable to the *site* conditions. Appendix X3 provides a robust list of *BMPs*. The ***Greener Cleanup BMP* Table in Appendix X3** is not exhaustive, and the *user* is encouraged to identify additional *BMPs* as part of this step, using checklists, guidelines, matrices, or tables of *BMPs* recognized within the environmental remediation industry or within similar industries that utilize environmentally beneficial practices, evaluations, and technologies (see 6.5.5).

6.6.1.1. During this step, the *user* should **consider only whether each individual *BMP* is potentially applicable** to the *cleanup phase* under evaluation, without regard to factors that ultimately will influence the decision to use a particular *BMP*, such as cost, logistics, or the relative benefits of other *BMPs*.

Case Study: ASTM Step 2, BMP Prioritization

Use your professional judgment to prioritize a subset of BMPs applicable to the case study site.

- **Prioritize each BMP based on its relative ability to reduce the environmental footprint of the cleanup**
- **Factors could include:**
  - ❑ **Volumes of needed materials, generated waste, air emissions, managed water, etc.**
  - ❑ **Project priorities relating to core elements of a greener cleanup**
  - ❑ **Potential to gain benefits for multiple core elements**
  - ❑ **State and regional priorities and initiatives concerning natural resources, energy, etc.**

Screening BMP Priority

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6.6.2 Step 2: BMP Prioritization—The *user* reviews the *BMPs* retained in Step 1 and **prioritizes the *BMPs* based on the relative ability of each *BMP* to reduce the *environmental footprint*** of the *cleanup* activity.

6.6.2.1 The *user* should identify those *BMPs* that are relatively unlikely to result in a significant reduction of the *environmental footprint* and assign them lower priority. The purpose of this designation is **to facilitate the elimination of those lower-value *BMPs*** in Step 3, in favor of higher-value *BMPs*.

6.6.2.2 The prioritization is **based on professional judgment and does not require a detailed analysis**.

6.6.2.3 If there are numerous potentially applicable *BMPs*, **the *user* may group *BMPs* into categories (for example, high, medium, low) based on the relative anticipated *environmental footprint* reductions.**

6.6.2.4 If a *BMP* has potential negative impacts on one or more *core elements* but positive impacts on others, the *user* should factor in those anticipated outcomes in the prioritization process.

6.6.2.5 As part of this step, the *user* should **prepare a prioritized list of *BMPs***.

Case Study: Step 2, ASTM BMP Prioritization - Worksheet

► Use your professional judgment to prioritize this subset of BMPs applying to the case study site ◄

	ASTM BMP Category	Applicable Best Management Practice	Priority		
			High	Medium	Low
A	Materials	Maximize the reuse of existing wells for sampling, injections or extractions, where appropriate, and/or design wells for future reuse			
B	Materials	Use products, packing material, and equipment that can be reused or recycled			
C	Materials	Use crushed concrete for biobarriers or capillary breaks instead of natural rock for landfill covers			
D	Power & Fuel	Use on-site generated renewable energy (including but not limited to e.g., solar photovoltaic, wind turbines, landfill gas, geothermal, biomass combustion, etc.) to fully or partially provide power otherwise achieved generated through onsite fuel consumption or use of grid electricity			
E	Site Preparation/ Land Restoration	Use lower permeability soils than required by regulation in landfill cover design when soils are available locally to reduce the amount of leachate generated			
F	Site Preparation/ Land Restoration	Use onsite uncontaminated sand, gravel, and rocks for drainage within landfill cover			
G	Site Preparation/ Land Restoration	Minimize use of pesticides through the use of green alternatives (for example, non-chemical solarizing technique) and an integrated pesticide management plan			
H	Vehicles & Equipment	Minimize diesel emissions through the use of retrofitted engines, ultra-low or low sulfur diesel or alternative fuels, or filter/treatment devices to achieve BACT or MACT			
I	Vehicles & Equipment	Use biodiesel produced from waste or cellulose-based products, preferring local sources wherever readily available to reduce transportation impacts			
J	Vehicles & Equipment	Soundproof all aboveground equipment housing to prevent noise disturbance to surrounding environment			
K	Wastewater	Use uncontaminated wastewater or treated water for tasks such as wash water, irrigation, dust control, constructed wetlands, or other uses			
L	N/A; referenced in US EPA material	Use alternate shipping methods			

Case Study: ASTM Step 3, BMP Selection

- **Review each BMP in the prioritized list and select BMPs to retain for implementation**
- **Base the selection on potential environmental footprint reductions**
- **Document a compelling reason for not selecting an applicable BMP**
- **Decision-making factors may include:**
  - ❑ **Implementability**
  - ❑ **Effectiveness**
  - ❑ **Reliability**
  - ❑ **Short-term risks**
  - ❑ **Community concerns**
  - ❑ **Cost**
  - ❑ **Potential for environmental trade-offs**
  - ❑ **Overall duration of applicability**

Using a sound basis and pertinent factors for BMP selection

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6.6.3 Step 3: BMP Selection—The *user* should review each *BMP* in the prioritized list and select *BMPs* to retain for implementation. This **selection should be based on potential *environmental footprint* reductions, relative to other pertinent factors such as implementability, effectiveness, reliability, short-term risks, community concerns, cost, and potential for environmental trade-offs**. The *user* should consider the unwanted transfer of *contaminants* from one environmental media to another, or negative affects on one *core element* from implementing a *BMP* with a positive impact on another *core element*. The *user* should document the rationale for eliminating *BMPs* identified in Step 2.

6.6.3.1 The *user* should implement *BMPs* that reduce or have no effect on the project cost, unless there is a specific reason not to do so (see Section 6.6.3 above for examples of factors). Some *users* may elect to implement *BMPs* even if implementation results in an increase in project cost. The **cost evaluation may assess the return on investment and other factors such as *environmental footprint* reductions achieved per unit cost and the degree to which the investment is beneficial to the overall project goals**.

Case Study: ASTM Step 4, BMP Implementation

- **Failure to implement a selected BMP is acceptable - - but must be documented**
- **Rationale for not implementing a selected BMP typically involves new information or changed circumstances; some examples:**
  - ❑ **A related field process or technique was found technically infeasible**
  - ❑ **Trial implementation of the BMP led to unacceptable reduction in treatment or controls**
  - ❑ **The project design changed and the BMP no longer applies**
  - ❑ **The project budget was reduced and the BMP was too costly to retain**
  - ❑ **A key local vendor relocated to a distant area**
  - ❑ **An intended waste receiver/recycler no longer operating**
  - ❑ **A field subcontractor inadvertently used an alternate practice**

Recording BMPs implemented and not implemented

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6.6.4 Step 4: BMP Implementation—The *user* should implement the selected *BMPs*.

6.6.4.1 If during implementation of the selected *BMPs*, new information or changed circumstances relevant to the *BMP* or the *site* render a *BMP* selected in Step 3 inapplicable, impracticable to implement, cost-prohibitive, or unacceptable to the public, the *user* may elect not to implement that specific *BMP*. The *user* should **document the rationale for not implementing any selected *BMPs* due to challenges that arise during implementation**.

Case Study: ASTM Step 5, BMP Documentation

This table shows a sample structure for documenting information collected in Steps 1 - 4, using illustrative results for the case study site.

- **Complete documentation demonstrating use of this BMP process is critical to users planning to make the project results publicly available**
- **Documentation may include a quantitative evaluation as estimated through a detailed footprint analysis or life cycle assessment**
- **Documentation for multiple cleanup phases may be combined in a single package that includes a separate "BMP table" for each cleanup phase**
- **Formatting and structure of the documentation is flexible**

Documenting the full BMP Process

Core Element					Applicable Best Management Practice	ASTM BMP Process				Rational for Not Implementing or Other Notation
Energy	Air	Water	M & W	L & A		Step 1, Applicable	Step 2, Prioritized	Step 3, Selected	Step 4, Implemented	
			X		Use products, packing material, and equipment that can be reused or recycled	X	Medium	Yes	Yes	
			X		Use crushed concrete for biobarriers or capillary breaks instead of natural rock for landfill covers	X	High	Yes	Yes	
		X			Use lower permeability soils than required by regulation in landfill cover design when soils are available locally to reduce the amount of leachate generated	X	Low	No	No	Found impracticable
			X		Use onsite uncontaminated sand, gravel, and rocks for drainage within landfill cover	X	Medium	Yes	Yes	
	X				Minimize diesel emissions through the use of retrofitted engines, ultra-low or low sulfur diesel or alternative fuels, or filter/treatment devices to achieve BACT or MACT	X	High	Yes	Yes	
X	X		X		Use biodiesel produced from waste or cellulose-based products, preferring local sources wherever readily available to reduce transportation impacts	X	High	Yes	No	Waste/cellulose-based product unavailable from local vendors

6.6.5 Step 5: BMP Documentation—The *user* should record Step 2 through Step 4 in a table. This includes **a prioritized list of *BMPs* that apply to the *site* conditions**, identifying those that are implemented and those that were not implemented, with the associated rationale.

6.6.5.1 **If a *quantitative evaluation* is to be performed** to assist in selecting applicable *BMPs* by providing numerical data to support the *BMP* selection or design, the *user* should follow the steps described in Section 7 for implementing the *quantitative evaluation*.

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Case Study: The Option of Publicly Reporting Use of the Guide

- **The "Documentation and Reporting" process for publicly reporting use of the Guide involves two separate steps**

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8. Documentation and Reporting
8.2 Step 1: Documenting the Process—For each *cleanup phase*, the *user* should create tables to document the *BMP process* as described in 6.6.

8.3 Step 2: Reporting the Process—The *user* should report the documentation in 8.2, along with the following:

8.3.1 A technical summary that includes: general *site* information; *site* status information; application of the *guide* relative to the *cleanup phases*; and anticipated *environmental footprint* reductions across the *core elements*.

- **Documentation from multiple cleanup phases may be combined in a single package**

- **Methods may involve a public repository, website posting, or submission to a regulatory agency (with prior agreement)**

Using the step-wise BMP tables for final documentation and public reporting

E2893 – 13

X2. TECHNICAL SUMMARY FORM

INTRODUCTION

Instructions: This form is an example template. The *user* may use this Technical Summary Form or another applicable format that contains the same information. The *user* can complete this form to summarize the *BMPs* implemented and *quantitative evaluation* performed, if appropriate. With the exception of Part 4.0, which is only applicable to *users* who performed a *quantitative evaluation*, the *user* should fill out all sections, or attach sheets, and input "NA" for items that are not applicable. If information is included in a report, the *user* only needs to reference the report.

X2.1 *General Information*

X2.1.1 *User's* name and organization:

X2.1.2 Date:

X2.1.3 Property name:

X2.1.4 *Site* location (address, city, state):

X2.1.5 Tax parcel ID # or EPA, state, project ID #:

X2.1.6 *Cleanup* program (for example, *RCRA*, state voluntary *cleanup* program):

X2.1.7 Lead oversight agency (for example, EPA, state, other):

X2.2 *Site Status Information*

X2.2.1 Current *cleanup phase*:

X2.2.2 *Contaminants* at the *site*:

X2.2.3 Current, historical, and *reasonably anticipated future use(s)* for the *site*, if known:

X2.2.4 Potential human or ecological receptors of contamination:

X2.2.5 Uses of adjacent properties:

X2.2.6 *Stakeholder* involvement in the *site*:

X2.2.7 Past or on-going *cleanup* activities:

X2.2.8 Technologies or engineering controls implemented:

X2.2.9 Interim or *final cleanup goals*, if established, and the status in achieving those goals:

X2.2.10 *Activity and use limitations*:

X2.3 *Application of Guide*—See Table X2.1.

X2.4 *Environmental Footprint Reduction*—Describe estimated *environmental footprint* reductions that resulted from implementing *BMPs* and a *quantitative evaluation*, if applicable, across the *core elements*. The anticipated *environmental footprint* reductions may be described qualitatively (only the *BMP process* was applied) or quantitatively (if a *quantitative evaluation* was conducted, in addition to the *BMP process*).

X2.5 *BMP Process Summary*—Provide the following for each *cleanup phase* in which the *guide* was implemented.

X2.5.1 Attach tables developed according to 6.6:

X2.5.2 List all *BMPs* that were required by *environmental laws* or regulations:

X2.6 *Quantitative Evaluation Summary*—For each *cleanup phase* or activity in which a *quantitative evaluation* was implemented, attach sheet(s) or reference the report(s) which includes the information listed in 7.4.7.

TABLE X2.1 Application of Guide (check all that apply)

Cleanup Phase	BMP Evaluation Process	Quantitative Evaluation Process with BMPs		Results Document	
		Footprint Analysis	LCA	Evaluation	Implementation
Site Assessment					
Remedy Selection					
Remedy Design/ Implementation					
Operation, Maintenance and Monitoring					
Remedy Optimization					